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I, JONNE YABSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2002953115 for a patent by OSMOSE (AUSTRALIA) PTY LTD and FMC (AUSTRALIA) LIMITED as filed on 05 December 2002.

WITNESS my hand this
Twenty-third day of December 2003

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Provisional Specification

GLUE LINE USE OF SYNTHETIC PYRETHROIDS FOR WOOD PRODUCTS

FIELD OF THE INVENTION

The invention pertains to wood treatment and more particularly to surface treatments of wood using synthetic pyrethroids.

BACKGROUND OF THE INVENTION

Bifenthrin is a synthetic pyrethroid insecticide/acaracide that is classified as a non-cyano pyrethroid. The active ingredient is efficacious to target pests through both contact and stomach action. As with most synthetic pyrethroids bifenthrin is active against a wide range of pests including Coleoptera, Diptera, Heteroptera, Hymenoptera, Homoptera, Isoptera, Lepidoptera, Orthoptera as well a number of species of Acarina. Bifenthrin is currently registered in a number of countries throughout the world for the control of a wide range of pests.

Bifenthrin is used extensively in many industries. For example: Cotton, grain, turf, pest control, flower, home garden and mosquito control. However has not been used in the timber industry.

Tests have demonstrated that when using standard practice in the timber industry, very low rates of bifenthrin are required to protect timber against ***Coptotermes acinaciformis***, the most economically important termite species in Australia and ***Mastotermes darwiniensis***, the most voracious in Australia and around the world.. The rates are 5 and 20 g/m3 respectively.

Standard treatment methods in Australia and around the world currently require some penetration into the timber by the preservative. This can be achieved by vacuum pressure, vacuum-vacuum systems that require a treatment vessel and expensive peripheral and computerized equipment. The process time required to treat the timber varies depending on the product but takes at least 45 minutes to treat wood. Penetration of preservatives can also be achieved by diffusion, a process which involves less expensive equipment but requires much more time and higher levels of stock holding. Wood moisture content is one of the most important parameters that control diffusion times. Wet wood is required to achieve diffusion within commercial expectancy. Full penetration of 90 mm thick radiata pine green sapwood can be achieved between 4 to 8 weeks.

OBJECTS AND SUMMARY OF THE INVENTION

Accordingly is it an object of the present invention to provide glues incorporating synthetic pyrethroids such as bifenthrin and methods and apparatus for the glue line use of synthetic pyrethroids as well as wood products made using those glues.

BEST MODE AND OTHER EMBODIMENTS OF THE INVENTION

Bifenthrin has been found also to be very effective when used as a glue line additive to protect engineered and reconstituted wood products against the attack of termites and other insects.

When using bifenthrin as an additive for Phenol Formaldehyde (PF) resins, 25g/m3 and 100 g/m3 are required to protect the product against the attack of Coptotermes acinaciformis and Mastotermes darwiniensis respectively.

Studies conducted using the drum test as described by the AWPA protocols used a 9-ply 2.5 mm thick veneer plywood treated with bifenthrin as a glue line additive. Results confirm that low rates of 25 and 100 g/m3 of Bifenthrin were sufficient to prevent Coptotermes acinaciformis and Mastotermes darwiniensis respectively from attacking the specimens. Tables 1 and 2 show these results.

Table 1

Mean mass loss (%) of radiata pine plywood treated with bifenthrin as a glue additive and exposed to Mastotermes darwiniensis

Treatment	Retention (g a.i/m3)	Plywood construction	Mean mass loss (%)	Standard error (SE)
Untreated	0	9 x 2.5	77.9	12.5
Bifenthrin	25	9 x 2.5	10.1	2.4
Bifenthrin	50	9 x 2.5	7.3	1.6
Bifenthrin	75	9 x 2.5	3.1	1.1
Chlordane	800	9 x 2.5	12.9	2.4
Phoxim	700	9 x 2.5	68.7	10.5

Table 2

Mean mass loss (%) of radiata pine plywood treated with bifenthrin as a glue additive and exposed to Coptotermes acinaciformis

Treatment	Retention (g a.i/m3)	Plywood construction	Mean mass loss (%)	Standard error (SE)
Untreated	0	9 x 2.5	89.4	3.0
Bifenthrin	25	9 x 2.5	1.9	1.0
Bifenthrin	50	9 x 2.5	0.5	0.4
Bifenthrin	75	9 x 2.5	0.7	0.2
Chlordane	800	9 x 2.5	1.4	0.4
Phoxim	700	9 x 2.5	29.6	9.0

Later studies were carried out to demonstrate that bifenthrin added to the glue line of engineered and reconstituted wood products was effective in products that contain plies of 3.2 mm thick veneer. These studies were conducted in laboratory conditions following AWPA protocols. Results confirm that Coptotermes acinaciformis do not penetrate the glue line at any angle at rates of 25 g/m3. It also demonstrates that using 2.5 mm thick plies plywood Mastotermes darwiniensis do not penetrate the glue line.

There are other additives used in glue lines to protect these products from termite attack, for example Zinc Borate that requires high application rates, is mobile and has questionable impact on active termites. The other product which could be used is Deltamethrin which is an irritant and degrades 90% due to the combinations of alkalinity of PF resins and temperature through the process.

Bifenthrin is stable at high pH and high temperatures. Phenol formaldehyde resins have a pH above 12. Phenol formaldehyde is the most common resin used for plywood and LVL manufacture. This high pH level degrades most common organic termiticides, Bifenthrin is a rare exception. Table 3 illustrates degradation thresholds for bifenthrin and common organic termiticides.

Table 3

PH and temperature degradation for several organic termiticides

Active	*Temperature oC*	*pH*
Permethrin	140-150	7.7
Cypermethrin	220	4-7.7
Deltamethrin	140-190	8
Bifenthrin	180-240	9.2

It has been demonstrated, through degradation trials conducted during the commercial manufacturing of plywood and LVL, that when using an emulsion concentrate formulation that contains particles less than 1 μm, the degradation observed averages 50%. When using a Suspension Concentrate with particles sizes ranging between 1-10 μm the degradation observed is only averages 15%. All efficacy testing has been carried out using an emulsion concentrate. This implies that by using a suspension concentrate the dosing required through the glue will much less.

Trials have demonstrated that bifenthrin can be dosed into the glue line during the batching of the resin mix or just prior to when the glue mix is used in the glue spreader or in any intermediate area between the batching of the resin mix and the application of the glue into the plies or before the resin is mixed into a usable glue.

When added protection of the faces is required, pressed products can be treated by spraying the faces before they have cooled down. The warmth in the product will create a hot-cold effect that will draw the applying solution deep into the face. Face treatments can also be applied onto a cold face. In this case we rely on the lathe checks as a pathway for the penetration of the chemical. Despite the fact that the penetration of a chemical when sprayed on cold faces is generally not as good as when spraying on warm faces, this can be improved by increasing the concentration of the chemical, increasing the uptake and wetting more of the faces, or by adding surfactants and chemicals that help the solution penetrate the faces better.

The surface treatment of faces can be done by dipping, rolling, brushing, deluging, misting and spraying. These systems can be installed in different areas of the LVL, plywood or any other mill that produces engineered and

reconstituted products either in-line or as a separate and distinct process. This depends of the lay-out of the production line or lines of a given mill.

Among the benefits of using bifenthrin as a glue line additive, in accordance with the teachings of the invention, is that:

1. The invention results in low rates of usage.
2. Degradation of the bifenthrin due to elevated pH is minimal in a 24-48 hour time frame. This allows dosing the resin in large batches.
3. Degradation of bifenthrin due to the combination of the high pH of the resin and the temperature of the process of manufacture is acceptable. The degradation is less than 50%.

This process of treating engineered wood products by adding bifenthrin in the glue line during the manufacture of plywood, LVL, OSB and flake boards has not been known to be used in Australia or in any other country.

Similarly bifenthrin can be added to the glue line during the manufacture of engineered wood products that use other resin systems, e.g., melamine urea formaldehyde or urea formaldehyde resins. The benefits are that:

1. Very low usage rates are required.
2. There is acceptable degradation due to pH of the resin and temperature of the process.
3. It is easy to dispose of the finished product due to very low or negligible dioxin emissions during burning of waste containing bifenthrin.